An appraisal of the Zoology of C. S. Rafinesque

Alwyne Wheeler
Department of Zoology, British Museum (Natural History), London SW7 5BD, U.K.

The name Rafinesque will be familiar to many zoologists as the author of a large number of names of European and North American animals. The attribution of these names and the recognition of Rafinesque that this entails is due possibly as much to the application of the Principle of Priority as to acknowledgement of the perspicacity of the author in recognising undescribed animals. It is, however, a reversal of the situation which obtained during his life-time, when an atmosphere of animosity and mistrust led to wilful neglect of his work by many of his contemporaries and immediate successors.

Constantine Samuel Rafinesque is said to have been born on 22 October 1783 (see Fitzpatrick, 1911), although the year of his birth may have been 1784. In his autobiography, *A Life of Travels* (Rafinesque, 1836), he made no reference to his birth date, although specific enough as to the place — 'Galata, a suburb of Constantinople' (now Istanbul). His father was a partner in the Marseilles trading company of Laflèche and Rafinesque, his business taking him to various parts of western Asia and the Mediterranean borderlands. Rafinesque's mother's maiden name was Schmaltz, and, as he reports, she was born in Greece but of a German family from Saxony. His early conscious childhood was spent mainly in the vicinity of Marseilles with short visits to Livorno (Leghorn) in Italy, and later to Genoa and Pisa. In March 1802 Rafinesque sailed from Leghorn to Philadelphia but he returned to Italy in 1805.

This first visit to North America allowed Rafinesque to explore (mainly on foot) the neighbourhood of Philadelphia, southwards to Chesapeake Bay and Virginia and inland to the Allegheny Mountains, visiting naturalists, inspecting herbaria and museum collections, and collecting. On his return to Italy he claimed to have made a collection of 10,000 herbarium specimens of 2,400 species, as well as zoological specimens.

In March 1805 he sailed for Sicily, where he spent the next ten years, first acting as Secretary and Chancellor to the Consul of the United States of America, but from 1808 trading as a merchant mainly in herbs. During this period Sicily became the residence of the Neapolitan Court, thus isolating it from Italy and France and bringing it under British influence. As a consequence of the Napoleonic wars there was an extensive British naval and military presence on the island. Amongst the latter was the naturalist William Swainson, a commissary officer in the Army, with whom Rafinesque made friends and made several excursions. The period in Sicily was highly productive and several of his major publications date from the decade ending in 1815, when he sailed again for North America.

His arrival on 2 November 1815 was marred by the loss of his collections, library, manuscripts, clothes, and his share of the cargo in a ship-wreck off Long Island. He was subsequently befriended by Samuel Latham Mitchill of New York, and through him was introduced to many influential scientists and to medical society. Until 1817 Rafinesque was occupied with re-establishing his trading business, developing contacts

with scientists in the area, and on local exploration. In 1818 he set out for a 2,000 mile journey, again mostly on foot, which was to take him west of the Alleghenies, and as far as Kentucky and Illinois.

From 1819 to 1825 he was a professor of modern languages and natural sciences at Transylvania University, Lexington, Kentucky. From this base he explored Kentucky, penetrating into Tennessee, collecting natural history material and interesting himself in archaeology and ethnography. Leaving Lexington, he settled in Philadelphia where his career as naturalist and collector, lecturer, and traveller continued but his business gradually failed. He died on 18 September 1840 in Philadelphia, after living in poverty and increasingly bad health for several years. His collections and library were sold at public auction. Call (1875) claimed the minerals and mollusc shells were without labels and were valueless. A collection of marine worms was later acquired by the Academy of Natural Sciences of Philadelphia (Call, 1875). Rafinesque's herbarium, said to contain 50,000 specimens, was damaged by mice and other pests before his death; much of it was later discarded by 'contemptuous curators' (Ewan, 1975).

Rafinesque's interests embraced many disciplines in natural history, and although he described new taxa in mammals, birds, reptiles, amphibians and several invertebrate groups his major zoological publications were concerned with fishes and molluscs. The most important publications fell into two chronological and geographical periods, 1810 on the fauna of Sicily and 1819–20 on the fauna of the Ohio River.

His *Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia* was published at Palermo in 1810. It comprises 105 numbered pages of text and 20 (folded) leaves of illustrations. The first 69 pages are on zoology (pp. 10–69 and pl. I–XVII being concerned with fishes, of which 155 species are described). This book is said by Fitzpatrick (1911) to have been issued in two parts, the first part, which is the zoological section of the book, being published in 1809 and comprising text pages 3–69. Fitzpatrick reproduced title pages of the *Caratteri*. . . (his Plates III and IV), showing both the 1809 and 1810 dates which also have differing texts, but the only evidence that he had for publication in 1809 was based on a single 'carelessly rebound and arranged' copy in the Library of Congress. His suggestion that the whole zoological part of the work was published with the 1809 title page was derived from this copy, which had presumably been arranged for binding so that 'Prima parte' (the heading on page 5) followed the 1809 title page, and 'Seconda parte' (the heading on page 71) followed the 1810 title page. In fact, the division of the book into two parts was simply to make a distinction between the zoological and the botanical texts.

By examining an uncut, unbound copy of the book in the Rijksmuseum van Natuurlijke Historie, Leiden, Holthuis & Boeseman (1977) were able to show that the *Caratteri*. . . was not published in two parts. They concluded that the first five sheets were set in type and the first three printed, but with Rafinesque's decision to dedicate the book to Antonino Bivona Bernardi a new first sheet had to be set and printed, including a new title page and half-title. They argued from measurement of the type area that the break between the 1809 and the 1810 printings occurred between pages 40 and 41 (i.e. after the fifth sheet), and this is confirmed by a noticeable difference in the texture of the paper at this opening in the BM(NH) copy. Taxonomists can therefore be reassured that these bibliographic niceties confirm that the whole work was published in 1810 despite the existence of cancelled title-pages dated a year earlier.

The delayed publication of the *Caratteri...* was explained by Rafinesque (1836) as due to his exploration of Mount Etna and a subsequent sickness.

Rafinesque's *Indice d'ittiologia Siciliana* was also published in 1810. It apparently postdates the *Caratteri...* as the dedication is dated 15 May 1810, and four pages of corrections and additions (pp. 66–69) are dated 1 September 1810. The numerous textual references to the *Caratteri...* would have been made possible by the delay between printing and publishing the latter work. The *Indice...* contains 70 pages of text and two folded plates; 376 species of fishes are named in the text with references to their description by Rafinesque in *Caratteri...* or to other authors, but 34 are descriptions of new taxa (in the Appendice), 6 undescribed species are named in the Supplemento and a further 7 species are described in the 'Correzzioni, ed aggiunte'. Although the *Indice...* might appear to be merely a digest of the larger work it has considerable nomenclatural importance as an original publication.

The systematic arrangement of the fishes differs totally from that adopted in the *Caratteri...* but this might have been due to the influence of William Swainson, who supervised the printing of the *Indice...* at Messina (Rafinesque, 1836).

The taxonomic purist might also wish to note that both the books published in Sicily give the author's name as C. S. Rafinesque Schmaltz, and the new taxa therein should be so attributed. As Rafinesque (1836) explained in his autobiography, prudence dictated that he wrote in Italian rather than his native French during the Napoleonic wars, and by the addition of his mother's family name, Schmaltz, he hoped to pass for an American citizen.

The second period of zoological taxonomic activity was marked by the publication of his work on the fauna of the River Ohio. In 1820 the *Ichthyologia Ohiensis, or natural history of the fishes inhabiting the River Ohio and its tributary streams* (Lexington, Kentucky) was published. An extremely rare book (Fitzpatrick, 1911, lists only 14 copies known to him), it was subsequently reprinted with introductory matter by Call (1899). The text was originally printed in nine instalments in the *Western Review and Miscellaneous Magazine* (Lexington, Kentucky) between December 1819 and November 1820, a sequence which suggests that the book may not have been published until the end of 1820. The new names for fishes published by Rafinesque therefore date from the journal publication, not the book. Dates of publication for the *Western Review and Miscellaneous Magazine* were given by Jordan (1877) and Call (1899). They are reproduced here from Jordan with references to the page numbers in *Ichthyologia Ohiensis:*

Ichth. Ohiensis	*Magazine:* part, pagination, date of publication	
1–13	Vol 1, pt 1, pp. 305–313	December 1819
13–29	2, pp. 361–377	January 1820
?–37	3, pp. ?–57	February(?) 1820
37–45	Vol 2, pt 4, pp. 169–177	April 1820
45–53	5, pp. ?–243	May 1820
53–60	6, pp. 299–307	June 1820
61–69	7, pp. 355–363	July 1820
69–77	Vol 3, pt 8, pp. 165–173	October 1820
77–84	9, pp. 244–252	November 1820

Jordan (1877) also gave a list of the new genera and species names proposed by Rafinesque for North American fishes in several earlier papers in the *American Monthly Magazine and Criticial Review* (Rafinesque 1817, 1818a,b,c,d), the *Journal of the Academy of Natural Sciences of Philadelphia* (Rafinesque, 1818e), the *Journal de Physique, de Chimie et d'Histoire Naturelle* (Rafinesque, 1819) and the *Quarterly Journal of Science, Literature and Arts of the Royal Institution* (Rafinesque, 1820b). He also attempted to identify all the taxa of freshwater fishes described by Rafinesque.

The year 1820 also saw the publication of Rafinesque's monograph on the bivalve shells of the River Ohio published in *Annales Générales des Sciences Physiques* in Belgium (Rafinesque, 1820c). This paper included descriptions of 12 genera and 68 undescribed species of unionid mollusc from the Ohio. It was reprinted (or reissued with titled cover and changed pagination) as *Monographie des coquilles bivalves et fluviatiles de la rivière Ohio,* under the imprint of Weissenbrach père, rue du Musée, Bruxelles (Fitzpatrick, 1911, no. 363). Both printings contained three uncoloured plates.

In 1832 C. A. Poulson published an English translation as *A monograph of the fluviatile bivalve shells of the River Ohio containing twelve genera & sixty-eight species* (Rafinesque, 1832). Fitzpatrick (1911, no. 608) had examined ten copies, all of which had the frontispiece uncoloured; the copy in BM(NH) has the single plate as a coloured frontispiece. Perhaps the most significant part of Poulson's introduction is his statement that Rafinesque had deposited most of the shells described with his labels and references in Poulson's collection. This is one of the few cases where type material was kept by Rafinesque.

A second separate edition in French was published in Paris with both a frontispiece and all three plates.

In his lifetime and in the decades after his death Rafinesque was strongly criticised and even ridiculed by many of his contemporaries. The attitude to his scientific standing can be summed up by the ornithologist Elliott Coues's reputed suggestion that the adjective 'rafinesque' should stand alongside grotesque and picturesque as descriptive of his work (Starling, 1978). One factor in this ridicule was certainly the way in which he described several fictitious fishes from the Ohio River from drawings provided by Audubon, although more recent commentators suggest that this reflects more on the character of Audubon than on Rafinesque's credibility. Other factors were the diversity of his interests, his industry, the frequent superficiality of his descriptions, and the prodigal way he described new taxa (Ewan (1975) claims that he proposed 6,700 binomials of which Starling (1978) says 3,000 were plants). His hyperactivity and apparent lack of critical judgement in his approach to taxonomy caused his North American peers to have serious reservations about his work. As a result, after 1820 Benjamin Silliman, the editor of the *American Journal of Science,* refused to accept papers from him for this the leading scientific journal in the continent. When Silliman returned all 18 of Rafinesque's unpublished manuscripts the latter assumed that the motive was jealousy at the quantity of his discoveries rather than a desire on the part of the editor to maintain standards.

Rafinesque was undoubtedly an eccentric, single-minded in his passion for science (which extended through many disciplines beyond natural history), and could possibly be regarded as a genius. Like others of this calibre he lacked a sense of proportion and critical ability, all of which made him difficult to comprehend.

However, he lived in a region and an era which gave him no advantages. His peripatetic childhood and youth deprived him of much formal education. Europe at the time was racked firstly by the French revolution and then by the Napoleonic wars and, being of French nationality but resident in Sicily, he was isolated at the outset of his career from close contact with the thriving natural science of France exemplified by Georges Cuvier and Antoine Risso. During his years in North America Rafinesque became alienated from many of the leading naturalists and this in turn isolated him from the influence of practised taxonomists and natural scientists such as his contemporaries Amos Eaton, John Torrey, Thomas Say, and Charles Alexander Lesueur, to the detriment of his work. In addition, after he left Lexington, until his death he suffered increasingly from the ill health and crushing poverty which ended in the unmarked grave in Philadelphia in 1840.

In the present century taxonomists, prompted by the need to establish the priority of Rafinesque's scientific names, have reassessed his work to produce a more favourable conclusion. Holthuis (1954) noted that Rafinesque proposed 19 new generic and 42 specific names for Crustacea of which, after critical review, he concluded that 8 generic and 21 specific names were the oldest available names for the taxa for which they had been proposed. Of these only 3 generic names and two species names were in use by carcinologists, and Holthuis (1956) proposed that the remainder of the names in Decapoda and Stomatopoda should be suppressed for the sake of nomenclatural stability. This was accepted by the International Commission on Zoological Nomenclature in Opinion 522 (1958).

Rafinesque's work on North American freshwater bivalves has received rather better treatment, and Bogan *et al.* (1984) have recently published a short assessment of his work. They show that of Rafinesque's 36 names at generic or subgeneric level and 124 species names, relatively few have been assimilated into the literature, and although on critical appraisal many will prove to be nomina dubia others may well be senior synonyms. Their work was based particularly on the 61 species of which they had type material. However, in a draft list of the Unionidae of North America prepared by Bogan, no fewer than 30 species had been described by Rafinesque.

Ichthyologists have dealt more kindly with Rafinesque's work than carcinologists or malacologists, and despite neglect of his work by Albert Günther in his influential *Catalogue of Fishes* (1859–1870), his names have been widely adopted. The names proposed for North American freshwater fishes were extensively reviewed by Jordan (1877) and subsequently have become assimilated into the literature. The checklist of fishes of North America (Robins *et al.*, 1980) attributes a total of 35 species names to Rafinesque, and several familiar genus names, such as *Etheostoma, Stizostedion, Lepomis, Ambloplites, Ictalurus, Noturus, Notropis,* and *Aplodinotus* are Rafinesque names.

From his writings on Sicilian fishes many taxa, principally European, take their names. Amongst sharks, for example, the well-known *Hexanchus, Heptranchias, Isurus, Alopias,* and *Sphyrna,* are all Rafinesque genera, as are *Tetrapturus, Naucrates,* and *Epigonus* amongst bony fishes. The reluctance of early ichthyologists to adopt some of these taxa was partly due to the absence of type specimens, Rafinesque making notes of the freshly caught fish, often in Sicilian fish markets, but not keeping the specimen. His work on North American fishes suffered from the same practice, many of his published descriptions being compiled from notes made at the time of capture from

specimens then discarded. Apart from the unionid bivalves referred to by Bogan *et al.* and the collection of marine worms in Philadelphia mentioned by Call (1875), no zoological type material of Rafinesque's has been claimed to have survived.

In conclusion, it can be said that in recent years Rafinesque has been awarded the recognition that is his due. Eccentric, uncritical, impatient, and lacking the steadying influence of contact with competent colleagues, he nevertheless made a major contribution to zoological taxonomy in both Europe and North America.

References

Bogan, A. E., Starnes, L. B. & Williams, J. D. 1984. An examination of some C. S. Rafinesque North American unionid taxa (Bivalvia: Unionidae). [Abstract]. *American Malacological Bulletin* **3**(1): 105–106.

Call, R. E. 1895. *The life and writings of Rafinesque,* xii + 227 pp; 1 pl. Filson Club, Louisville, Kentucky.

Call, R. E. 1899. *Sketch of the life, the ichthyologic work, and the ichthyologic bibliography of Rafinesque in Ichthyologia Ohiensis...* [Reprinted edition: Burrows Brothers Co., Cleveland.]

Ewan, J. 1975. Rafinesque, Constantine Samuel. *Dictionary of Scientific Biography,* **11**: 262–264.

Fitzpatrick, T. J. 1911. *Rafinesque: a sketch of his life with bibliography,* 241 pp; 31 pls. Historical Department of Iowa, Des Moines.

Holthuis, L. B. 1954. C. S. Rafinesque as a carcinologist, an annotated compilation of the information on Crustacea contained in the works of that author. *Zoologische Verhandelingen,* **25**: 1–43.

Holthuis, L. B. 1956. Proposed suppression under the plenary powers of certain names given by C. S. Rafinesque to genera and species of the orders Decapoda and Stomatopoda (Class Crustacea).... *Bulletin of Zoological Nomenclature* **12**: 227–239.

Holthuis, L. B. & Boeseman, M. 1977. Notes on C. S. Rafinesque Schmaltz's (1810) *Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia. Journal of the Society for the Bibliography of Natural History,* **8**: 231–234.

Günther, A. 1859–1870. *Catalogue of the fishes in the British Museum.* 8 vols. British Museum, London.

Jordan, D. S. 1877. Contributions to North American ichthyology. I. Review of Rafinesque's memoirs on North American fishes. *Bulletin of the U.S. National Museum* **9**: 1–53.

Rafinesque Schmaltz, C. S. 1810a. *Caratteri di alcuni nuovi generi e nuove specie di animali e piante della Sicilia con varie osservazioni sopre i medesimi,* 106 pp; xx pl. Palermo.

Rafinesque Schmaltz, C. S. 1810b. *Indice d'ittiologia Siciliana ossia...* 70 pp; 2 pl. Messina.

Rafinesque, C. S. 1817. First decade of new North–American fishes. *The American Monthly Magazine and Critical Review,* **2**(II): 120–121.

Rafinesque, C. S. 1818a. Descriptions of two new genera of North-American fishes. *The American Monthly Magazine and Critical Review,* **2**(III): 203–204.

Rafinesque, C. S. 1818b. Second decade of new North-American fishes. *The American Monthly Magazine and Critical Review,* **2**(III): 204–206.

Rafinesque, C. S. 1818c. Discoveries in natural history, made during a journey through the Western Region of the United States, by Constantine Samuel Rafinesque... *The American Monthly Magazine and Critical Review,* **3**(V): 354–356.

Rafinesque, C. S. 1818d. Further account of discoveries in natural history, in the Western States, by Constantine Samuel Rafinesque, Esq... *The American Monthly Magazine and Critical Review,* **4**(I): 39–42.

Rafinesque, C. S. 1818e. Description of three new genera of fluviatile fish, *Pomoxis, Sarchirus* and *Exoglossum. Journal of the Academy of Natural Sciences of Philadelphia,* **1**(II): 417–422.

Rafinesque, C. S. 1819. Prodrome de 70 nouveaux genres d'animaux découverts dans l'intérieur des Etats–Unis d'Amérique, durant l'année 1818. *Journal de Physique, de Chimie et d'Histoire Naturelle, et des Arts,* **88**: 417–429.

Rafinesque, C. S. 1820a. *Ichthyologia Ohiensis, or natural history of the fishes inhabiting the River Ohio and its tributary streams...* [Reprinted edition: Burrows Brothers Co., Cleveland, 1899].

Rafinesque, C. S. 1820b. Description of the Silures or catfishes of the River Ohio. *Quarterly Journal of Science, Literature, and the Arts*, The Royal Institution of Great Britain, **9**: 48–52.

Rafinesque, C. S. 1820c. Monographie des coquilles bivalves fluviatiles de la rivière Ohio, contenant douze genres et soixante–huit espèces. *Annales Générales des Sciences Physiques*, **5**: 287–322, (2 pl.).

Rafinesque, C. S. 1832. *A monograph of the fluviatile bivalve shells of the River Ohio containing twelve genera & sixty–eight species.* [Translated by C. A. Poulson.] 72 pp; 1 pl. J. Dobson, Philadelphia.

Rafinesque, C. S. 1836. *A Life of travels and researches in North America and South Europe...*, 148 pp. Philadelphia.

Robins, C. R., Bailey, R. M., Bond, C. E., Brooker, J. R., Lachner, E. A., Lea, R. N. & Scott, W. B. 1980. *A list of common and scientific names of fishes from the United States and Canada.* Special Publication, American Fisheries Society, no. 12, 174 pp.

Sterling, K. B. 1978. Introduction to *Rafinesque, autobiography and lives*. 15 pp. Arno Press, New York.